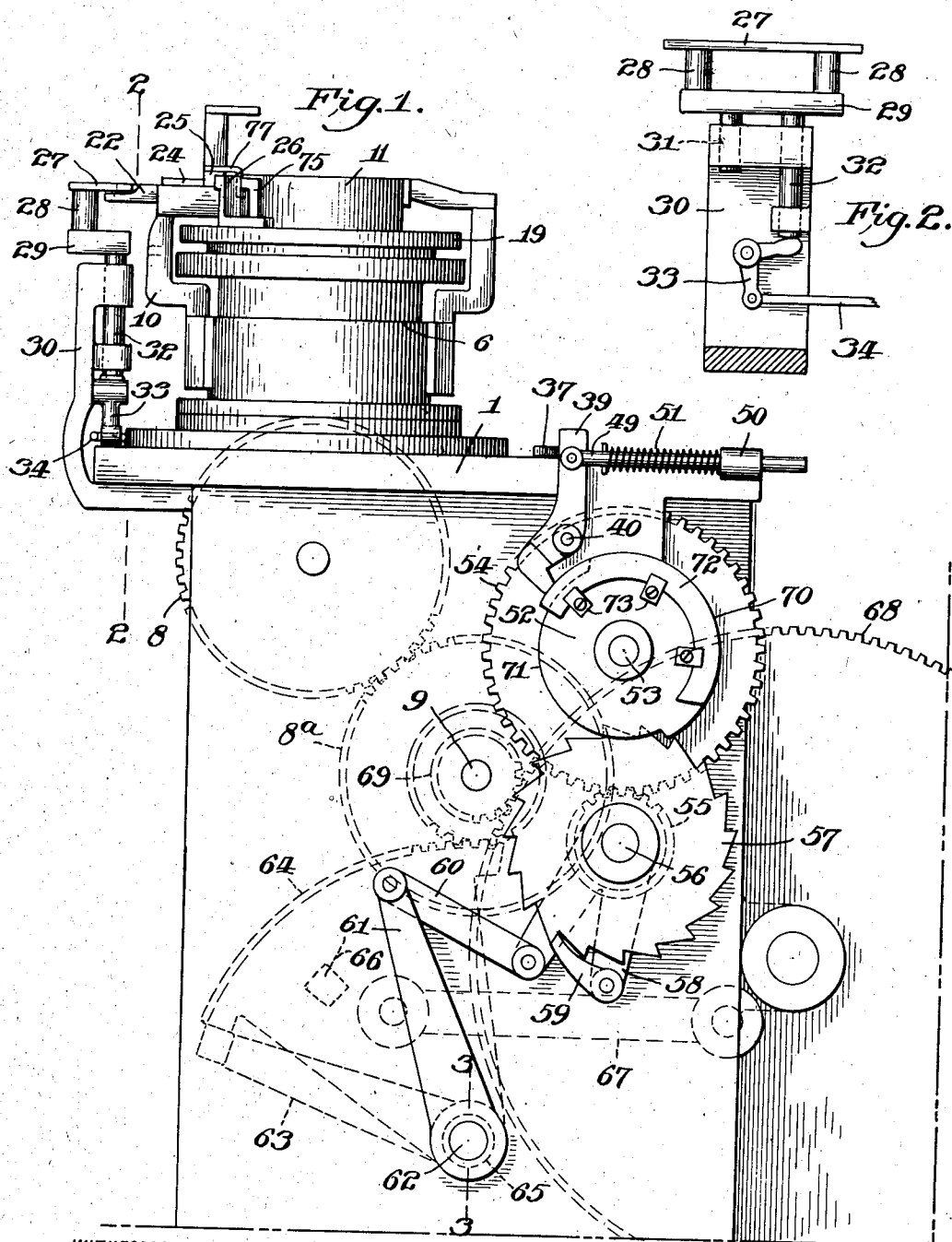


No. 839,200.

PATENTED DEC. 25, 1906.

F. C. REHM.
KNITTING MACHINE.
APPLICATION FILED SEPT. 19, 1904.

3 SHEETS—SHEET 1.



WITNESSES:

H. H. Leanty.
H. L. Chasman

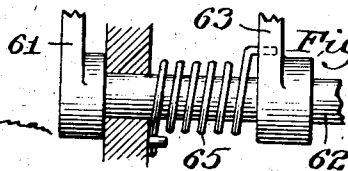


Fig. 3.

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3 SHEETS—SHEET 2.

Fig. 4.

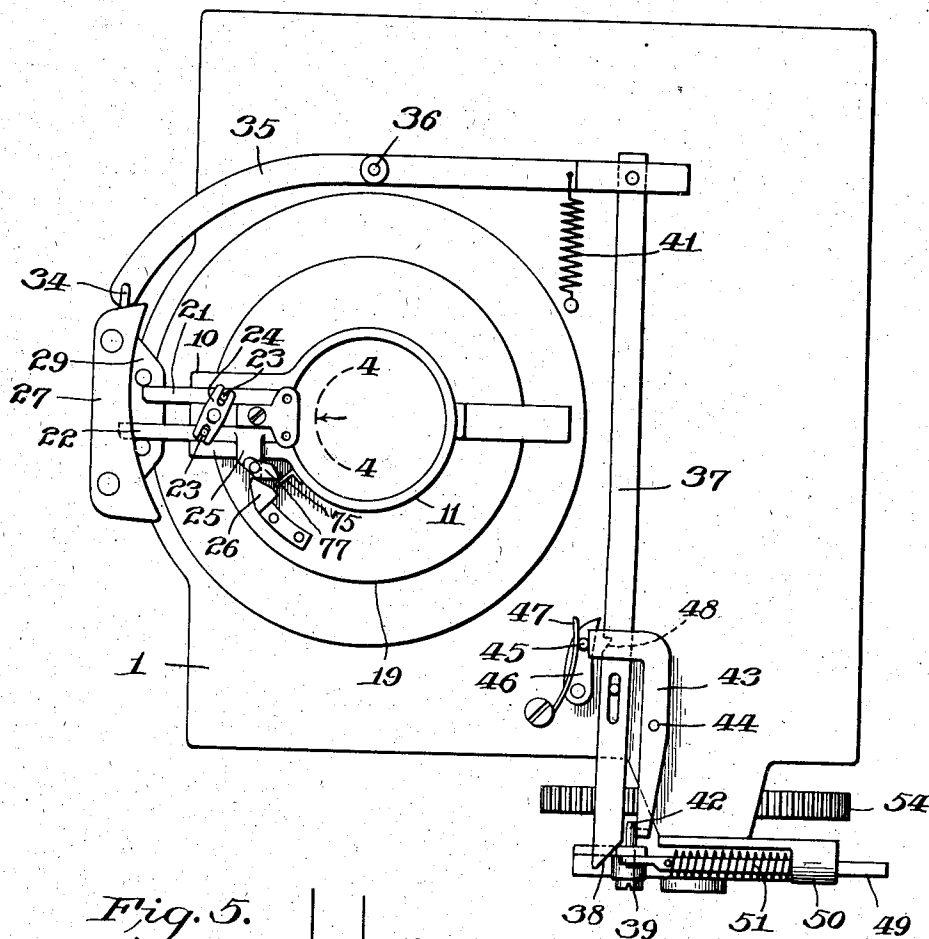
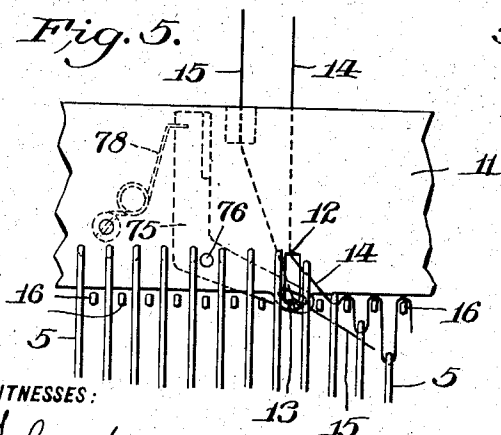


Fig. 5.



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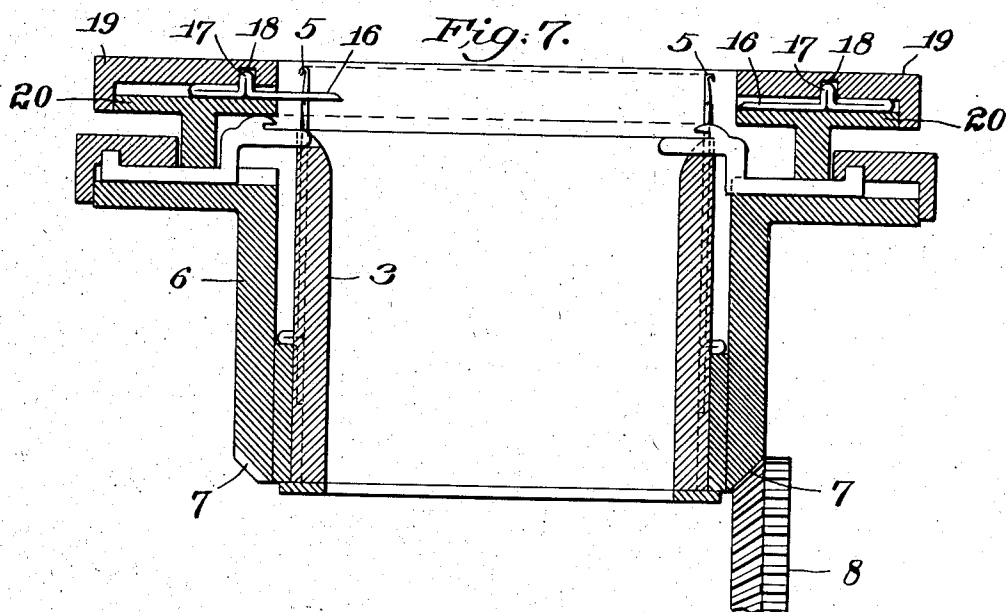
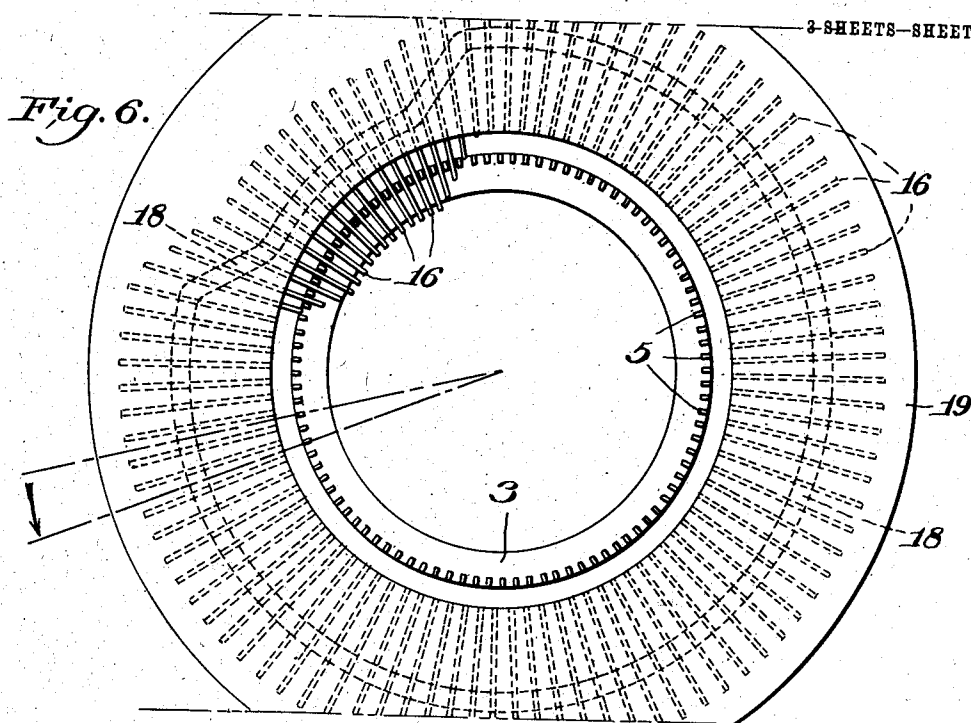
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- 2 SHEETS - SHEET 3.



UNITED STATES PATENT OFFICE.

FREDERICK C. REHM, OF DETROIT, MICHIGAN.

KNITTING-MACHINE.

No. 839,200.

Specification of Letters Patent.

Patented Dec. 25, 1906.

Application filed September 19, 1904. Serial No. 225,059.

To all whom it may concern:

Be it known that I, FREDERICK C. REHM, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a specification.

This invention relates to knitting-machines, and particularly to that class of knitting-machines illustrated in my previous Letters Patent, No. 535,461, dated March 12, 1895, and No. 619,840, dated February 21, 1899, to which reference may be had. The machines illustrated in the said Letters Patent are provided with means whereby a knitted fabric having tufts or pile-loops on one of its faces may be produced.

The object of my present invention is to provide a knitting-machine with mechanism whereby it will automatically produce knitted fabric provided with the said tufts or pile-loops and a plain knitted fabric at certain intervals, as occasion may require.

With this object in view the invention consists in the novel construction and combinations of parts, which will be hereinafter fully described and claimed.

In the drawings, Figure 1 is an elevation of a knitting-machine provided with my invention. Fig. 2 is a sectional detail as on the line 2 2 of Fig. 1. Fig. 3 is a sectional detail as on the line 3 3 of Fig. 1. Fig. 4 is a plan view of the machine. Fig. 5 is a detail development as on the line 4 4 of Fig. 4, showing the operation of forming the loops. Fig. 6 is a plan view of the needle-cylinder, the needles, the loop-forming devices, and the cam-ring for actuating the devices, the arrow showing the direction of advancement of the cam-ring with relation to the needle-operating mechanism and the dot-and-dash lines showing the amount of such advancement. Fig. 7 is a vertical section through the cam-cylinder, needle-cylinder and adjuncts.

1 designates the bed-plate; 3, the needle-cylinder; 5, the needles, and 6 the cam-cylinder. The cam-cylinder is mounted to rotate in the bed-plate and is provided with gear-teeth 7, which coast with the teeth of a gear-wheel 8, which is driven by a gear-wheel 8^a on the main driving-shaft 9, by means of which the cam-cylinder is rotated to actuate the needles.

Mounted on the cam-cylinder 6 is a bracket 10, which supports the usual latch-guard 11

and carries the thread-feeding eyes 12 and 13, by means of which the threads 14 and 15 are directed to the needles during the knitting operation.

16 designates a series of radially-arranged loop forming or holding devices slidably fitted to a ring 20, which is supported by the needle-cylinder 3. The loop-holders are arranged slightly above the top of the needle-cylinder 3 or plane where the stitches are formed, and they correspond in number with and are adapted to be moved radially between the needles 5. The holders 16 are provided with butts or projections 17, which extend into a camway 18, formed in the under side of a ring 19, which is rotatably mounted on the ring 20, and is adapted to be rotated with the cam-cylinder 6, as will hereinafter appear. The contour of the camway 18 is such that during the rotation of the ring 19 the loop-holders 16 are maintained normally withdrawn from between the needles 5, and are projected inwardly between the needles where the needles are lowered to form the stitches, and are withdrawn from between the needles immediately following the raising of the needles after the formation of the stitches.

The thread-guiding eye 12 is located slightly above the eye 13 to provide a space between the threads 14 and 15 being delivered to the needles 5. Just as the needles 5 descend to engage the threads 14 and 15 to form the stitches the loop-holders 16 are projected inwardly through the space between said threads and the spaces between the needles 5. Thus it will be seen that both threads will be knitted into the fabric and that the threads 14 will be drawn over the loop-holders 16, as shown in Fig. 4, before being drawn into the fabric, and thus produce the tufts or pile-loops. After the stitches have been formed and the needles raised to the normal level, the loop-holders 16 are withdrawn from between the needles to discharge the loops and to be again projected inwardly for a succeeding operation during the formation of the next course of stitches.

Generally considered, the construction and operation of the machine thus far is the same as that shown and described in my previous Letters Patent hereinbefore referred to.

I shall now proceed to describe the preferred form of mechanism whereby the ma-

chine is caused to automatically produce a knitted fabric provided with the tufts or pile-loops and a plain knitted fabric at certain predetermined intervals.

5 Slidingly fitted to the bracket 10 is a pair of parallel horizontally-arranged bars 21 and 22, which are movable toward and from the center of the machine. These bars are provided with pins 23, which project into slots
10 in the respective ends of a lever 24, which is pivotally mounted upon the bracket 10, midway between the bars 21 and 22, whereby when one bar is moved toward the center of the machine the lever 24 will operate to move
15 the other bar away from the center of the machine, and the converse.

The bar 22 is provided with a projection 25, which is adapted to engage a lug 26, projecting from the cam-ring 19, as a means
20 whereby the cam-ring 19 may be rotated with the cam-cylinder 6. The projection 25 and lug 26 are provided with opposing cam-surfaces which engage each other, whereby when the bar 22 is moved outwardly the cam-
25 ring 19 will be advanced into operative position with respect to the knitting-cams carried by the cam-cylinder 6 and correspondingly advance the timing of the inward movement of the loop-holders 16 with respect
30 to the downward pull of the needles 5 during the knitting operation, and when the bar 22 is moved outwardly during the rotation of the cam-cylinder the cam-surface of the projection 25 will move against the cam-
35 surface of the lug 26 and retard the movement of the cam-ring 19 with respect to the knitting-cams and correspondingly retard the inward movement of the loop-holders 16 with respect to the downward pull of the
40 needles 5. The timing of the inward movement of the loop-holders 16 with respect to the downward pull of the needles 5 is such that when the cam-ring 19 is advanced by moving the bar 22 outwardly the loop-holders
45 16 will enter between the threads 14 and 15 being delivered to the needles 5, and thus produce the tufts or pile-loops from the thread 14 upon the inner face of the fabric being knitted, and when the cam-ring 19 is retarded
50 by moving the bar 22 inwardly the loop-holders 16 will move inwardly in rear of the two threads 14 and 15, and thus permit the needles 5 to engage both threads in the usual manner to produce a plain knitted fabric. Thus it will be seen that by moving the
55 bar 22 outwardly during the knitting operation the machine will produce a knitted fabric provided with the tufts or pile-loops, and that by moving the bar 22 inwardly the machine will cease to knit the tufted fabric and
60 will produce a plain knitted fabric.

The outer ends of the bars 21 and 22 terminate in different horizontal planes, the end of the bar 21 being slightly above the bar
65 22, and the said ends are adapted to engage

a vertically-movable cam 27 during the operation of the machine. This cam 27 is mounted upon posts 28, rising from a bar 29, which rests normally upon a bracket 30, rising from the bed-plate 1. Depending from
70 the bar 29 are guide-rods 31 and 32, which are slidingly fitted to openings in the bracket 30. The lower end of the rod 32 is adapted to be engaged by one end of a bell-crank lever 33, which is pivoted to the bracket 30.
75 When the lever 33 is moved in one direction, it engages the rod 32 and raises the cam 27 into the path traversed by the outer end of the bar 21, and when the lever 33 is moved in the reverse direction the cam 27 is low-
80 ered until the bar 29 rests upon the bracket 30, in which position the cam 27 is in the path traversed by the outer end of the bar 22.

The bell-crank lever 33 is connected by a link 34 with one end of a lever 35, which is
85 pivoted to the bed-plate 1, as at 36. The other end of the lever 35 is pivoted to one end of a longitudinally-reciprocative bar 37, mounted upon the bed-plate 1, whereby when the bar 37 is moved back and forth
90 the levers 33 and 35 will be rocked to raise and lower the cam 27. The other end of the bar 37 is provided with an inclined cam-surface 38, which is adapted to be engaged by the upper end of a lever 39, which is pivoted,
95 as at 40, to the side of the machine, and the bar 37 is drawn normally toward the lever 39 by the action of a suitable spring 41, one end of which is secured to the lever 35 adjacent to the bar 37 and the other end of which is
100 secured to the bed-plate 1. The upper end of the lever 39 is provided with a projecting pin 42 to engage one end of a lever 43, which is pivoted to the bed-plate 1, as at 44. The other end of the lever 43 is in engagement
105 with a pin 45, projecting from a pawl 46, which is also pivoted to the bed-plate adjacent to the bar 37. Bearing against the pin 45 is a spring 47, which tends to move the pawl 46 toward the bar 37 and the lever 43
110 toward the pin 42. When the lever 39 is moved in one direction, it will engage the cam-surface 38 and move the bar 37 against the action of the spring 41, and at the same time move the pin 42 away from the lever 43,
115 thereby permitting the spring 47 to move the pawl 46 into engagement with a notch 48 in the bar 37 to maintain said bar in its position against the action of the spring 41, and when the lever 39 is moved in the reverse
120 direction the pin 42 will engage and move the lever 43, which in turn will engage the pin 45 and move the pawl 46 from engagement with the notch 48, and thus permit the spring 47 to shift the bar 37 back into
125 engagement with the lever 39. Thus it will be seen that this back-and-forth motion of the lever 39 will reciprocate the bar 37 in a manner to operate the levers 33 and 35 to raise and lower the cam 27. Pivoted to the
130

upper end of the lever 39 is a rod 49, which extends freely through a lug 50, projecting from the machine. This rod 49 is provided with a spring 51, which tends normally to maintain the lower end of the lever 39 in engagement with the cam-wheel 52, fixed to a shaft 53, having its bearings in the side frame of the machine. This shaft 53 is provided with a gear-wheel 54, in mesh with a pinion 55 on a shaft 56, which is provided with a ratchet-wheel 57. Loosely mounted on the shaft 56 is an oscillatory arm 58, carrying a pawl 59 in engagement with the ratchet-wheel 57. The arm 58 is connected by a link 60 to the upper end of an arm 61, projecting from a rock-shaft 62, whereby when the shaft 62 is rocked the pawl 59 will engage the ratchet-wheel 57 to actuate the shaft 56, which through the pinion 55 and gear-wheel 54 will slowly rotate the cam-wheel 52.

The shaft 62 is provided with a projecting arm 63, adapted to be engaged by a sector 64 and moved against the action of a spring 65 to rock the shaft 62 a suitable stop 66 being provided to limit the movement of the arm 63 with the spring 65 as the sector moves away from said arm. The sector 64 is loosely mounted on the shaft 62 and is connected by a link 67 to a gear-wheel 68, which is driven by a gear-wheel 69 on the main driving-shaft 9, whereby the sector 64 is oscillated.

The cam-wheel 52 is provided with a high and a low portion 70 and 71, respectively, and it is also provided with a segmental plate 72, extending to the edge of the high portion 70 and secured to the side of the wheel 52 by suitable clamps 73. By loosening the clamp 73 the plate 72 may be adjusted around the wheel 52 to vary the lengths of the high and low portions 70 and 71. The lower end of the lever 39 extends over both the wheel 52 and the plate 72.

By the hereinbefore-described construction it will be seen that during the operation of the machine to produce the knitted fabric the cam-wheel 52 is slowly rotated, thereby causing the high and low portions 70 and 71 of said wheel to engage the lower end of the lever 39 in alternate succession, and thus rock the lever 39 to cause the bar 37 to be moved back and forth, and thus effect the raising and lowering of the cam 27 at certain predetermined intervals, as previously explained. When the cam 27 occupies the raised position, the bar 21 will be moved inwardly thereby to cause the lever 24 to move the bar 22 outwardly to advance the cam-ring 19 to produce the tufts or pile-loops upon the fabric. So long as the cam 27 remains down, or while the low portion 71 of the cam-wheel 52 is engaged with the lever 39, the machine will produce the tufts or pile-loops upon the fabric. Therefore when the high portion 70

engages and rocks the lever 39 the cam 27 will be raised into the path traversed by the bar 22, which will engage the cam 27 and be moved inwardly thereby to retard the movement of the cam-ring 19, and thus cause the machine to cease to produce the tufted fabric and to produce plain knitted fabric, so long as the lever 39 rests against the high portion 70 of the cam-wheel 52. By loosening the clamps 73 and adjusting the plate 72 the length of the tufted portions and the length of the plain portions of the fabric being produced may be varied.

I have found it desirable to raise the thread-feeding eye 13 very close to the eye 12 to bring the threads 14 and 15 close together during the production of the plain knitted fabric, particularly so when the invention is used in connection with a machine for knitting stockings, for the reason that one of the threads 14 and 15 if separated is likely to catch upon the loop-holders 16 when the direction of motion of the cam-cylinder 6 and thread-feeds are reversed during the reciprocation of the cam-cylinder in knitting the heel and toe parts of a stocking. To accomplish this, I form the eye 13 in one end of a lever 75, which is pivoted to the latch-guard 11, as at 76, and is held normally in the position shown by the action of a spring 78, secured to the latch-guard and engaging the lever. The other end of the lever 75 extends outwardly in line with an arm 77, carried by the bar 22, to the end that when the bar 22 is moved inwardly to cause the machine to produce plain knitted fabric the arm 77 will take against the lever 75 and move it against the action of the spring 78 to bring the eye 13 close to the eye 12, and when the bar 22 is moved outwardly in causing the machine to produce tufted fabric the spring 78 will be permitted to move the lever 75 to lower the eye 13 to the position shown.

While I have herein shown and described my invention in a desirable and practical form, yet I do not limit myself to this particular construction, as the same may be greatly modified without departing from the invention.

I claim—

1. In a knitting-machine the combination with stitch-forming mechanism including a cam-cylinder and means for continuously rotating the same, of mechanism adapted to produce tufts or pile-loops upon one face of the fabric being knitted, and means for automatically causing said mechanism to cease the production of the tufts or loops to permit the machine to produce a plain knitted fabric during the continuous rotation of the cam-cylinder.

2. In a knitting-machine the combination with stitch-forming mechanism including a cam-cylinder and means for continuously rotating the same, of mechanism adapted to

produce tufts or pile-loops upon one face of the fabric being knitted, means for automatically causing said mechanism to cease the production of the tufts or loops to permit the machine to produce a plain knitted fabric during the continuous rotation of the cam-cylinder, and means for automatically causing said mechanism to resume the production of tufts or loops during the continuous rotation of the cam-cylinder, substantially as described.

3. In a knitting-machine, the combination with the needles, thread-feeding means, and means to actuate the needles to effect their operation upon the thread, of a series of loop-forming devices, and means for automatically causing said series to produce tufts or pile-loops upon the fabric being knitted and to discontinue the production of the loops at certain predetermined intervals, substantially as described.

4. In a knitting-machine, the combination with the needles, thread-feeding means, and means including a cam-cylinder to actuate the needles to effect their operation upon the thread, means for continuously rotating the cam-cylinder, of a series of loop-forming devices adapted to act upon the thread in conjunction with the needles to form loops, means for actuating the series, means for advancing the operation of the series with respect to the operation of the needles to produce loops upon the fabric being knitted during the continuous rotation of the cam-cylinder, and means for retarding the operation of the series with respect to the operation of the needles to discontinue the production of the loops during the continuous rotation of the cam-cylinder, substantially as described.

5. In a knitting-machine, the combination with the needles, thread-feeding means, the cam-cylinder and the knitting-cams carried thereby to effect the operation of the needles upon the thread, of a series of loop-forming devices, a cam movable with the cam-cylinder and adapted when in operative position to actuate the series to produce tufts or pile-

loops upon the fabric being knitted and when out of operative position to cause the series to cease to produce loops, and means for automatically moving the series actuating-cam into and out of operative position without changing the operation of the needles, substantially as described.

6. In a knitting-machine, the combination with the needles, thread-feeding means, the cam-cylinder and the knitting-cams carried thereby to effect the operation of the needles upon the thread, of a series of loop-forming devices, a cam-ring carried by the cam-cylinder and partially rotatable with respect thereto to be advanced with respect to the knitting-cams into operative position to actuate the series to produce loops upon the fabric being knitted and retarded with respect to the knitting-cams to cause the series to cease to produce loops, and means for automatically advancing and retarding the cam-ring at certain predetermined intervals, substantially as described.

7. In a knitting-machine, the combination with the needles, means for feeding two threads thereto, and means to actuate the needles to effect their operation upon the threads, of a series of loop-forming devices, means for automatically causing said devices to move between said threads to produce the tufts or pile-loops upon the fabric being knitted, means for automatically causing said devices to cease to move between said threads to permit the machine to produce plain knitted fabric, means for increasing the space between said threads during the production of the tufts or loops, and means for decreasing the space between said threads during the production of plain knitted fabric, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK C. REHM.

Witnesses:

EDWARD Y. CUTSCH,
CHAS. E. KAUTER.